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BIOLOGICAL BULLETIN

THE MARINE BIOLOGICAL LABORATORY

SIXTEENTH REPORT

FOR THE YEAR 1913

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I. TRUSTEES

EX OFFICIO

F. R. LILLIE, *Director*, The University of Chicago.
 GILMAN A. DREW, *Assistant Director*, Marine Biological Laboratory.
 D. BLAKELY HOAR, *Treasurer*, 161 Devonshire Street, Boston, Mass.
 GARY N. CALKINS, *Clerk of the Corporation*, Columbia University.

TO SERVE UNTIL 1917

S. F. CLARKE.....Williams College.
 CHARLES A. COOLIDGE...Ames Building, Boston, Mass.
 C. R. CRANE.....2559 Michigan Boulevard, Chicago, Ill.,
 President of the Board.

ALFRED G. MAYER.....Carnegie Institution.
 C. E. McCLUNG.....University of Pennsylvania.
 T. H. MORGAN.....Columbia University.
 ERWIN F. SMITH.....United States Department of Agriculture.
 E. B. WILSON.....Columbia University.

TO SERVE UNTIL 1916

H. H. DONALDSON.....Wistar Institute of Anatomy and Biology.
 M. J. GREENMAN.....Wistar Institute of Anatomy and Biology.
 C. W. HARGITT.....Syracuse University.
 H. S. JENNINGS.....Johns Hopkins University.
 GEORGE LEFEVRE.....University of Missouri, Secretary of the
 Board.
 A. P. MATHEWS.....University of Chicago.
 G. H. PARKER.....Harvard University.

TO SERVE UNTIL 1915

H. C. BUMPUS.....University of Wisconsin.
 R. A. HARPER.....Columbia University.
 W. A. LOCY.....Northwestern University.
 JACQUES LOEB.....The Rockefeller Institute for Medical Re-
 search.
 F. P. MALL.....Johns Hopkins University.
 GEORGE T. MOORE.....Missouri Botanical Garden, St. Louis.
 L. L. NUNN.....Telluride, Colo.
 JOHN C. PHILLIPS.....299 Berkeley Street, Boston, Mass.

TO SERVE UNTIL 1914

CORNELIA M. CLAPP....Mount Holyoke College.
 E. G. CONKLIN.....Princeton University.
 ROSS G. HARRISON.....Yale University.
 CAMILLUS G. KIDDER....27 William Street, New York City.
 M. M. METCALF.....Oberlin College.
 WILLIAM PATTEN.....Dartmouth College.
 JACOB REIGHARD.....University of Michigan.
 W. B. SCOTT.....Princeton University.

II. ACT OF INCORPORATION

No. 3170.

COMMONWEALTH OF MASSACHUSETTS

Be It Known, That whereas Alpheus Hyatt, William Sanford Stevens, William T. Sedgwick, Edward G. Gardiner, Susan Minns,

Charles Sedgwick Minot, Samuel Wells, William G. Farlow, Anna D. Phillips and B. H. Van Vleck have associated themselves with the intention of forming a Corporation under the name of the Marine Biological Laboratory, for the purpose of establishing and maintaining a laboratory or station for scientific study and investigation, and a school for instruction in biology and natural history, and have complied with the provisions of the statutes of this Commonwealth in such case made and provided, as appears from the certificate of the President, Treasurer, and Trustees of said Corporation, duly approved by the Commissioner of Corporations, and recorded in this office;

Now, therefore, I, HENRY B. PIERCE, Secretary of the Commonwealth of Massachusetts, do hereby certify that said A. Hyatt, W. S. Stevens, W. T. Sedgwick, E. G. Gardiner, S. Minns, C. S. Minot, S. Wells, W. G. Farlow, A. D. Phillips, and B. H. Van Vleck, their associates and successors, are legally organized and established as, and are hereby made, an existing Corporation, under the name of the MARINE BIOLOGICAL LABORATORY, with the powers, rights, and privileges, and subject to the limitations, duties, and restrictions, which by law appertain thereto.

Witness my official signature hereunto subscribed, and the seal of the Commonwealth of Massachusetts hereunto affixed, this twentieth day of March, in the year of our LORD ONE THOUSAND, EIGHT HUNDRED and EIGHTY-EIGHT.

HENRY B. PIERCE,

Secretary of the Commonwealth.

[SEAL.]

III. BY-LAWS OF THE CORPORATION OF THE MARINE BIOLOGICAL LABORATORY

The annual meeting of the members shall be held on the second Tuesday in August, at the Laboratory, in Woods Hole, Mass., at 12 o'clock noon, in each year, and at such meeting the members shall choose by ballot a Treasurer and a Clerk, who shall be, *ex officio*, members of the Board of Trustees, and Trustees as hereinafter provided. At the annual meeting to be held in 1897, not more than twenty-four Trustees shall be chosen, who shall be divided into four classes, to serve one, two, three, and four years, respectively, and thereafter not more than eight Trustees shall be chosen annually for the term of four years. These officers shall hold their respective offices until others are chosen and qualified in their stead. The Director and Assistant Director, who shall be chosen by the Trustees, shall also be Trustees, *ex officio*.

II. Special meetings of the members may be called by the Trustees, to be held in Boston or in Woods Hole at such time and place as may be designated.

III. The Clerk shall give notice of meetings of the members by publication in some daily newspaper published in Boston at least fifteen days before such meeting, and in case of a special meeting the notice shall state the purpose for which it is called.

IV. Twenty-five members shall constitute a quorum at any meeting.

V. The Trustees shall have the control and management of the affairs of the Corporation; they shall present a report of its condition at every annual meeting; they shall elect one of their number President and may choose such other officers and agents as they may think best; they may fix the compensation and define the duties of all the officers and agents; and may remove them, or any of them, except those chosen by the members, at any time; they may fill vacancies occurring in any manner in their own number or in any of the offices. They shall from time to time elect members to the Corporation upon such terms and conditions as they may think best.

VI. Meetings of the Trustees shall be called by the President, or by any two Trustees, and the Secretary shall give notice thereof by written or printed notice sent to each Trustee by mail, postpaid. Seven Trustees shall constitute a quorum for the transaction of business. The Board of Trustees shall have power to choose an Executive Committee from their own number, and to delegate to such Committee such of their own powers as they may deem expedient.

VII. The President shall annually appoint two Trustees, who shall constitute a committee on finance, to examine from time to time the books and accounts of the Treasurer, and to audit his accounts at the close of the year. No investments of the funds of the Corporation shall be made by the Treasurer except approved by the finance committee in writing.

VIII. The consent of every Trustee shall be necessary to dissolution of the Marine Biological Laboratory. In case of dissolution, the property shall be given to the Boston Society of Natural History, or some similar public institution, on such terms as may then be agreed upon.

IX. These By-Laws may be altered at any meeting of the Trustees, provided that the notice of such meeting shall state that an alteration of the By-Laws will be acted upon.

X. Any member in good standing may vote at any meeting, either in person or by proxy duly executed.

IV. TREASURER'S REPORT

CASH RECEIPTS AND DISBURSEMENTS
FOR THE YEAR ENDING DECEMBER 31, 1913

RECEIPTS

Cash on hand January 1, 1913.....	\$ 4,788.70	
Annual dues.....	1,012.00	
BIOLOGICAL BULLETIN.....	2,031.46	
Boats.....	5.00	
Carpenter shop.....	12.89	
Chemical department.....	3.17	
Charles R. Crane.....	21,000.00	
Donations.....	35.00	
Dormitory, stone building.....	338.25	
Dormitory, Whitman cottage.....	236.50	
Fish trap.....	337.48	
Instruction, botany.....	350.00	
Instruction, embryology.....	1,150.00	
Instruction, physiology.....	450.00	
Instruction, zoölogy.....	1,600.00	
Library.....	1.43	
Maintenance buildings and grounds.....	7.83	
Mess.....	12,152.26	
Mess extension.....	339.86	
Miscellaneous.....	373.24	
Pile driver.....	35.00	
Research.....	2,575.00	
Supply department.....	14,554.40	\$63,389.47

PAYMENTS

Administration.....	\$ 6,932.18
Bath house.....	8.00
BIOLOGICAL BULLETIN.....	2,344.13
Botany building.....	516.65
Boats.....	4,566.01
Carpenter shop.....	215.14
Chemical department.....	2,022.34

Dormitory, stone building.....	283.55	
Dormitory, Whitman cottage.....	547.10	
Fish trap.....	897.60	
Instruction, botany.....	1,125.00	
Instruction, embryology.....	454.31	
Instruction, physiology.....	650.00	
Instruction, zoölogy.....	1,081.00	
Lectures.....	48.35	
Library.....	1,177.41	
Maintenance buildings and grounds.....	4,477.27	
Mess.....	11,042.28	
Mess extension.....	3,971.12	
Miscellaneous.....	2,281.48	
New laboratory.....	740.44	
Oil house.....	436.86	
Philosophical lectures.....	100.00	
Pile driver.....	87.77	
Pumping station.....	1,890.39	
Store house.....	106.18	
Supply department.....	9,439.16	
Supply department, improvements.....	1,284.70	
Cash on hand January 1, 1914.....	<u>4,663.05</u>	\$63,389.47

CASH RECEIPTS AND DISBURSEMENTS ON ACCOUNT OF FUNDS
AUGUST 1, 1913, TO JANUARY 1, 1914

RESERVE FUND

Cash on hand August 1, 1913.....	\$ 222.12	
Div. 6 shs. Am. Smelting & Refining Co. Pfd.....	21.00	
Div. 8 shs. Gen. Elec. Co.....	16.00	
Div. 14 shs. United Shoe Mach. Corp. Pfd.....	5.25	
Interest on deposit.....	<u>3.51</u>	\$ 267.88

CROCKER FUND

Cash on hand August 1, 1913.....	88.79
Div. 1 sh. Am. Tel. & Tel. Co.....	2.00
Div. 18 sh. Vermont & Mass. R. R. Co.....	54.00

Div. 1 sh. West Wnd St. Ry. Co.....	1.75	
Div. 2½ sh. Gen. Elec. Co.....	<u>5.00</u>	
	\$ 151.54	
Payment of 2 scholarships.....	<u>100.00</u>	51.54

LIBRARY FUN

Cash on hand August 1, 1913.....	\$ 191.04	
Div. 3 shs. Am. Tel. & Tel. Co.....	6.00	
Div. 1 sh. Am. Smelting & Refining Co.		
Pfd.....	3.50	
Div. 2½ shs. Gen. Elec. Co.....	5.00	
Div. 5 shs. United Shoe Mach. Corp. Pfd...	<u>1.87</u>	<u>207.41</u>
Cash on January 1, 1914.....		\$526.83

MARINE BIOLOGICAL LABORATORY
INVESTMENTS (BOOK VALUE)

JANUARY 1, 1914

RESERVE FUND

\$3,000 Am. Tel. & Tel. Co. 4%.....	\$2,921.25	
6 shs. Am. Smelting & Refining Co. Pfd.....	732.00	
8 shs. Gen. Elec. Co.....	972.05	
14 shs. United Shoe Mach. Corp. Pfd.....	393.75	
Cash.....	<u>267.88</u>	
	\$5,286.93	
Part of the above stocks and bonds is held as collateral for loan of.....	<u>3,000.00</u>	\$2,286.93

LIBRARY FUND

3 shs. Am. Tel. & Tel. Co.....	\$ 381.18	
4/5 of \$1,000 Am. Tel. & Tel. Co. 4%.....	779.00	
1 sh. Am. Smelting & Refining Co. Pfd.....	122.00	
2½ shs. Gen. Elec. Co.....	288.10	
5 shs. United Shoe Mach. Corp. Pfd.....	140.63	
Cash.....	<u>207.41</u>	1,918.32

LUCRETIA CROCKER FUND

18 shs. Vermont & Mass. R. R. Co.....	\$2,416.50	
1 sh. West End St. Ry. Co.....	83.00	
1 sh. Am. Tel. & Tel. Co.....	127.06	

1/5 of \$1,000 Am. Tel. & Tel. Co. 4%	194.75	
2½ shs. Gen. Elec. Co.	323.85	
Cash	<u>51.54</u>	3,196.70
		<u>\$7,401.95</u>

V. LIBRARIAN'S REPORT

AUGUST, 1913

With expenditures about the same, approximately \$1,000, the library has been considerably improved in several ways since last year.

1. Most important is the gift from the Carnegie Institution of a complete set of publications relating to our work. There are very few laboratories in this list, so the placing of the library on the mailing list is a decided gain. In this way about 85 valuable monographs, not otherwise available, have been received.

2. Last year, about this time, a strong representation was placed before a number of publishing firms, of the advantages to them of sending here copies of works on science and education. The response was very prompt and generous; and as a result about 150 books have been added representing a value of over \$250. A word to publishers on the part of authors will now be sufficient to explain to them the value of such advertisement as is furnished by a place on our shelves.

3. In response to letters enclosing lists showing missing parts and asking aid in completing our sets, we have been able to fill in some bad gaps; and are still receiving assistance here. The lists are available to anyone who will help.

4. An important departure, which we hope will establish a precedent, has been the gift of subscriptions to new journals by members of the corporation: *The Popular Science Monthly*, *The American Journal of Anatomy*, *The American Naturalist*, *The Annual Bulletin of the Zoölogical Museum of the Imp. Acad. of Science, St. Petersburg*, and *The Journal of The Society for Experimental Biology and Medicine*. Drs. A. Mayer, Bumpus, and Knowler have each given \$10 a year for five years toward journals, either for new subscriptions or missing parts of back sets. Much

extension of this assistance is desirable as more journals are greatly needed and we are only spending at the present time about \$700 for this purpose.

5. We have added by exchange: *Bulletin Scientifique de La France et Belgique*, Vols. 26 to 46; *Mittheilungen aus dem Naturhistorisches Museum in Hamburg*, Vols. 7 to 29; also a complete series of the *Monist* and the *Wilson Bulletin* from Oberlin, O.

6. The reprint collection has been greatly improved by rearrangement and considerable addition. We must, however, appeal again for gifts to this collection. It is in much demand and we are quite dependent on authors to remember this.

Finally, the librarian feels obliged to urge the great importance of now engaging a trained assistant with ability to carry on, throughout the year, a systematic campaign to develop the library. This work should be done under the general direction of the librarian, by maintaining a business-like correspondence in regard to accessions, exchanges, missing parts, etc. It is the only way in which we can steadily and adequately improve. The peculiarly free methods used in this library demand constant study of the shelves, catalogues, etc., to take account of losses, needed repairs and disarrangements caused by the free access to the shelves. This is especially necessary after the summer session; otherwise the entire collection becomes more or less disorganized and chaotic and there is inevitable loss from year to year. The binding, catalogues, special sets, repairs, reprints have to be constantly watched and kept strictly up to date, to make the material which we have more available. We have been suffering from very inadequate and irregular assistance.

Dr. Drew's work on the catalogues and binding and the enterprise of his office in pushing some of the schemes which have improved things have demonstrated what can and should be done.

This summer, as soon as Dr. Drew's office force was diverted into its regular work, we were again obliged to drop back to carrying through the routine demands of the busy season, with what aid we could secure. Much more could and should be done through a permanent assistant librarian keeping behind the library work winter and summer.

I should recommend that such an appointment be made in advance of the move to our permanent quarters; since this should be supervised by an experienced person, and because there is important preliminary work now awaiting attention.

H. MC. E. KNOWER,
Librarian.

VI. THE DIRECTOR'S REPORT

TO THE TRUSTEES OF THE MARINE BIOLOGICAL LABORATORY:

Gentlemen: I have the honor to transmit herewith a report of the twenty-sixth session of the Marine Biological Laboratory. The year just drawing to a close has been in many respects the most successful and encouraging since the foundation of the Laboratory. Not only has there been a great increase in attendance which has tasked our accommodations beyond our previous estimates of the uttermost, but the spirit of research has never been more intense or on a higher plane, and many interesting results have been obtained. If these could in some way be exhibited together I feel confident that they would amount to a really great increase in the resources of biological facts and principles. This matter is, however, intangible and impossible to estimate at close range. Even after publication the results of a particular piece of investigation are not capable of immediate appraisal; and but little of last season's work is yet published. Moreover in our absolutely free method of organization with no prescription as to material, or subject matter, or method of investigation, and no restriction as to time or place of publication, one can gain only the most general impression of the results actually secured by so large a body of investigators. I can only feel, and express the opinion, that the laboratory is maintaining its best traditions in these respects.

Turning to the record of the principal events of the year: the attendance of the investigators was in excess of the largest previous attendance by nearly one third; the actual figures are 122 in 1913, 93 in 1912, 82 in 1911, 62 in 1910. The number of students in courses was 69, making a total attendance of in-

investigators and students of 191, as compared with 160 in 1912, 147 in 1911 and 126 in 1910. The number of subscribing institutions was 30 in 1913, as compared with 29 in 1912, 25 in 1911, 24 in 1910, 20 in 1909, 18 in 1908 and 16 in 1907. The list is given on p. 339. Of these Barnard College, the Crocker Research Fund of Columbia University, Harvard University, Kansas State Agricultural College and Radcliffe College are new subscriptions. The receipts from the subscribing institutions and students' fees were \$6,160 in 1913, as compared with \$5,175 in 1912, \$4,574.99 in 1911, \$4,150 in 1910 and \$3,700.35 in 1909. The receipts from the supply department were \$14,554.40 in 1913, as compared with \$13,966.35 in 1912, \$10,303.61 in 1911, \$9,300.58 in 1910, and \$8,549.55 in 1909.

At the beginning of 1913 a new system of book-keeping was established with the aid of Dr. Drew. While this may cause some difficulty in comparison of the treasurer's report for the current year with the preceding reports, it gives a much more accurate idea of the real classification of expenses and the cost of departments, and it is hoped that it may furnish the basis for more complete comparisons in the future. The book-keeping is now done at Wood's Hole, under the supervision of the treasurer, instead of in Boston as formerly; this is a great aid in administration, as it enables the executive officers to keep closer account of receipts and expenditures.

Great improvements were made in the mess in preparation for the past summer session. The dining-room was enlarged by about 50 per cent., a wide covered verandah was built around three sides of it; the kitchen was much enlarged and its ventilation improved and a new laundry built. The expense of these improvements, \$5,720.16, was provided for partly by the earnings of the mess \$1,581.70, partly by subscriptions amounting to \$2,147.33 from a considerable number of subscribers, and partly by current funds of the Laboratory to which the mess now stands indebted in the sum of \$1,991.13.

The large increase of investigators was accommodated by utilizing the Kidder Annex, the Yacht Club building, and every available corner of the old buildings. The progress of the new building was therefore particularly inspiring in its promise of

relief from overcrowding. We purpose to publish an illustrated account of this building in the BIOLOGICAL BULLETIN at an early date. We shall therefore deal briefly with it here:

At the winter meeting of the board of trustees in 1909 a committee was appointed to prepare plans for a permanent building of fireproof construction, to accommodate the library and to include a number of research laboratories equipped for more delicate researches and capable of being used at all seasons of the year. The president of the board, Mr. Charles R. Crane, promised to contribute the necessary funds for construction, and our fellow member of the board, Mr. Charles A. Coolidge, the distinguished architect, agreed to furnish the plans of the building as his contribution. Such concurrence of generous support has rarely happened in the history of any institution. Plans were carefully studied by the committee in charge, and an interior arrangement best suited to our needs was agreed on; Mr. Coolidge then prepared various exterior plans. After much study and discussion it was finally agreed that the simplest plan of architecture was most in keeping with our traditions and the location. In the summer of 1912 the plans were complete. They were submitted to many of the workers at the laboratory for criticism and suggestion and were finally approved by the board. The contracts were signed that winter and construction was begun in February, 1913.

The location decided on was selected as part of a plan for the location of several more buildings of permanent construction. The new building faces south on the Woods Hole Harbor. It is constructed of tapestry brick with stone trimmings; in form rectangular 92 by 50 feet, three stories and a high basement. The height of the three stories, the proportions of the openings, the construction of the cornice, and the nature of the materials combine to produce a pleasing effect of great dignity. The building is now nearly completed and will be ready for occupancy in March, 1914.

Hitherto the work of the Laboratory has been carried on in buildings of an avowedly temporary character. The completion of the first permanent building, therefore, marks a stage in the growth of the laboratory deserving of especial recognition. I,

therefore, recommend to the board, at the suggestion of the president, that special exercises of dedication be held to commemorate the event early in the next summer session, and that a committee be appointed to make arrangements therefor. The significance of the event relates not only to the development of our institution, but also especially to the dedication of so adequate an equipment for the purposes of research in pure science outside of our universities.

Among the clearly defined tendencies in the growth of our institution is the increase in numbers of our membership. As I pointed out in my last report the living accommodations in Woods Hole for transient workers at the Laboratory are actually inadequate. We need more dormitory space, especially for women. The suggestion in my last report that one of the smaller laboratory buildings might be made over as a dormitory for women seems now to be impracticable, if the increase in attendance of last summer is any indication of what to expect in the future.

There is a great need of cottages for the families of workers at the Laboratory. Those available are held at exorbitant rents. As the personnel of the investigators is really our prime consideration this is a problem of importance. By coöperation it should be possible for such persons to build bungalows without financial loss. But unless some plan is organized from the Laboratory nothing is likely to be done, because the people interested are not in touch with one another. It would be an important aid to the cause of science if someone would erect a group of small cottages that might be rented for a small return on the investment at from \$100 to \$200 for the season.

We have provided a fine library room well equipped for several times the present number of volumes. The development of the library should now be made a special problem. The appointment of a library assistant for the entire year would be a most desirable step in this direction. Until this is done, the development of the library is likely to be spasmodic and slower than need be. I refer to the report of the librarian (p. 324) on this subject.

A new and larger lecture hall is another immediate need and the improvement of the rooming house for employees of the mess yet another.

The equipment of the new laboratory has been provided for by an additional gift from Mr. Crane, and the executive officers have proceeded with the necessary plans in order to avoid delay in the opening of the building. The most important part of the preparation, viz: provision for adequate pumping facilities, is completely arranged for. It involves construction of a wharf on the harbor front to carry a supply pipe out to deep water, but also useful for other laboratory purposes, and the installation of pumps and the power plant. After considerable inquiry we decided on hard rubber pumps of such construction that no metal can come in contact with the sea-water. We believe that all sources of metal contamination of the sea-water in the system of pumping and distribution have been avoided. The valves in the system are of special lead, manufactured by the Crane Valve Company, thus avoiding a source of metal contamination in the use of brass or bronze valves. The power will be furnished by electric motors with a reserve gasoline engine. Other details of equipment need not be included in this report.

At the last meeting of the board of trustees the director and assistant director were authorized to proceed with plans for the improvement of the water front. Surveys were accordingly made, and plans prepared for the erection of sea-walls both on the harbor and eel-pond frontage; wharves in connection with these improvement were also planned, and filling and grading in order to utilize the space in the best possible way. Such part of these plans as required state permits were presented to the harbor and land commission of the state of Massachusetts and the permits secured. The drawings of these projects are herewith presented.

It is not necessary to proceed with all of this work at once; but it is essential that anything undertaken should be part of a general plan, and this is the idea we have had in mind in planning so much at once.

We still have before us the necessity of an endowment before we can feel certain that the operation of the Laboratory can be continued uninterruptedly. The estimates for the year 1914 show a probable deficit of about \$20,000, a very small sum considering the magnitude and significance of our operations. An

endowment of \$500,000 would permanently insure our present status at least, and I feel very strongly that every effort should be made to raise such a sum before we prepare for farther expansion.

I. THE STAFF

1913

F. R. LILLIE, DIRECTOR,
Professor of Embryology, The University of Chicago.

GILMAN A. DREW, ASSISTANT DIRECTOR,
Marine Biological Laboratory.

ZOÖLOGY

I. INVESTIGATION

Zoölogy and Embryology

- GARY N. CALKINS.....Professor of Protozoölogy, Columbia University.
E. G. CONKLIN.....Professor of Zoölogy, Princeton University.
GILMAN A. DREW.....Assistant Director, Marine Biological Laboratory.
GEORGE LEFEVRE.....Professor of Zoölogy, University of Missouri.
FRANK R. LILLIE.....Professor of Embryology, The University of Chicago.
T. H. MORGAN.....Professor of Experimental Zoölogy, Columbia University.
E. B. WILSON.....Professor of Zoölogy, Columbia University.

II. INSTRUCTION

- CASWELL GRAVE.....Associate Professor of Zoölogy, Johns Hopkins University.
GEORGE A. BAITSELL....Dean and Professor of Biology, Central College.
RAYMOND BINFORD.....Professor of Biology, Guilford College.
J. K. BREITENBECKER...Fellow in Zoölogy, University of Chicago.
E. J. LUND.....Bruce Fellow in Zoölogy, Johns Hopkins University.
T. S. PAINTER.....Graduate Student of Zoölogy, Yale University.

EMBRYOLOGY**I. INVESTIGATION (See Zoology)****II. INSTRUCTION**

GILMAN A. DREW.....Assistant Director, Marine Biological Laboratory.

LORANDE L. WOODRUFF...Assistant Professor of Biology, Yale University.

A. L. TREADWELL.....Professor of Biology, Vassar College.

ROBERT A. BUDINGTON...Associate Professor of Zoölogy, Oberlin College.

PHYSIOLOGY**I. INVESTIGATION**

ALBERT P. MATHEWS....Professor of Physiological Chemistry, The University of Chicago.

R. S. LILLIE.....Assistant Professor of Experimental Biology, University of Pennsylvania.

HAROLD C. BRADLEY....Assistant Professor of Physiological Chemistry, University of Wisconsin.

II. INSTRUCTION

RALPH S. LILLIE.....Assistant Professor of Experimental Biology, University of Pennsylvania.

WALTER E. GARREY....Associate Professor of Physiology, Washington University Medical School.

FRANK P. KNOWLTON...Professor of Physiology, Syracuse University.

EDWARD B. MEIGS.....Associate in Physiology, Wistar Institute of Anatomy and Biology.

PHILOSOPHICAL ASPECTS OF BIOLOGY AND ALLIED SCIENCES**LECTURES**

EDWARD G. SPAULDING...Assistant Professor of Philosophy, Princeton University.

BOTANY

GEORGE T. MOORE.....Engelmann Professor of Botany, Washington University.

GEORGE R. LYMAN.....Assistant Professor of Botany, Dartmouth College.

B. M. DUGGAR.....Professor of Plant Physiology, Washington University.

- IVEY F. LEWIS.....Assistant Professor of Botany, University of Wisconsin.
 W. J. ROBBINS.....Assistant in Plant Physiology, Cornell University.
 R. H. COLLEY.....Instructor in Botany, Dartmouth College.
 A. R. DAVIS.....Lockland Research Fellow, Shaw School of Botany.

LIBRARY

- H. MCE. KNOWER.....University of Cincinnati, Librarian.

CHEMICAL SUPPLIES

- OLIVER S. STRONG.....College of Physicians and Surgeons, New York City, Chemist.

-
- G. M. GRAY.....Curator of Supply Department.
 A. L. LEATHERS.....Collector.
 JOHN VEEDER.....Cockswain.
 F. M. MACNAUGHT.....Business Assistant.

2. INVESTIGATORS AND STUDENTS

1913

INVESTIGATORS 1913

ZOOLOGY

Independent Investigators

- ALLEE, W. C., Instructor in Zoölogy, Williams College.
 BAITSELL, GEORGE A., Graduate Student, Yale University.
 BECKWITH, CORA J., Instructor in Biology, Vassar College.
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SHULL, A. FRANKLIN, Assistant Professor of Zoölogy, University of Michigan.
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 HOGE, MILDRED A., Graduate Student, Columbia University.
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 HYDE, IDA H., Professor of Physiology, University of Kansas.
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Beginning Investigators

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STRINGER, CAROLINE E., Head of Biology Department, Omaha High School.

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HIBBARD, RUFUS P., Instructor in Plant Physiology, Michigan Agricultural College.
LEWIS, I. F., Assistant Professor of Botany, University of Wisconsin.
LYMAN, GEORGE R., Assistant Professor of Botany, Dartmouth College.
MOORE, GEORGE T., Director, Missouri Botanical Gardens.
NICHOLS, SUSAN P., Associate Professor of Botany, Oberlin College.
OSTERHOUT, W. J. V., Professor of Botany, Harvard University.
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FOSTER, GOODWIN L., Graduate Student, Dartmouth College.
HOPPING, ALEITA, Tottenville, Staten Island, New York.
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ROBERTS, EDITH A., Instructor in Botany, Mount Holyoke College.

STUDENTS

1913

ZOÖLOGY

- ABBOTT, CHARLES H., Student, Brown University.
ALLEN, CHARLES E., Student, Wabash College.
ATWOOD, WARREN G., Student, Dartmouth College.
BAKER, FLORENCE I., Student, Carleton College.
BAUMANN, EMIL J., Student, Yale University.
BEYER, HENRY G., U. S. Navy, Retired.
BOBB, THOMAS N., Instructor in Zoölogy, Northland College.
BRADLEY, BARBARA, Technical Assistant in Zoölogy, University of Wisconsin.

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STONE, PHEBE, Student, Goucher College.
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EMBRYOLOGY

ALLEN, EZRA, Professor of Biology, School of Pedagogy, Philadelphia.
ALLEN, GEORGE D., Instructor in Zoölogy, University of Minnesota.
BEERS, CATHERINE V., Student, Northwestern University.
BEHRE, ELINOR H., Instructor in Zoölogy, Sophie Newcomb College, Tulane
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BURR, HAROLD S., Currier Fellow, Sheffield Scientific School, Yale University.
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MAY, H. G., Graduate Student, University of Rochester.
MEIERHOF, HAROLD L., Student, Columbia University.
PHIPPS, CHARLES F., Instructor, School of Education, University of Chicago.

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YOCUM, HARRY B., Instructor, Wabash College.

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MATEER, JOHN G., Student, Wooster University.

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PHILLIPS, RUTH L., Instructor in Biology, Western College.

ROOT, FRANCIS M., Graduate Student, Johns Hopkins University.

TRUEBLOOD, IRA C., Head of Biological Department, High School, Greencastle, Indiana.

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THURLOW, MADGE D., Goucher College.

SMITH, EDITH L., Assistant, West Roxbury High School.

STEWART, MARY W., Assistant, Barnard College, Columbia University.

3. TABULAR VIEW OF ATTENDANCE

	1910	1911	1912	1913
INVESTIGATORS—Total	62	82	93	122
Independent				
Zoölogy	33	42	44	58
Physiology	11	18	14	17
Botany	9	8	10	11
Under Instruction				
Zoölogy	6	12	21	21
Physiology	2	2	2	7
Botany			2	7
STUDENTS—Total	64	65	67	69
Zoölogy	31	26	24	33
Embryology	10	20	15	22
Physiology	5	6	11	8
Botany	17	13	17	7
TOTAL ATTENDANCE	126	147	160	191

INSTITUTIONS REPRESENTED

Total.....			57	80
By investigators.....	26	37	43	50
By students.....	24	31	36	41

SCHOOLS AND ACADEMIES REPRESENTED

By investigators.....	5	3	2	3
By students	6	9	1	6

4. SUBSCRIBING INSTITUTIONS, 1913

BARNARD COLLEGE.

BRYN MAWR COLLEGE.

CARLETON COLLEGE.

COLUMBIA UNIVERSITY.

CROCKER RESEARCH FUND OF COLUMBIA UNIVERSITY.

DARTMOUTH COLLEGE.

ELSE SERINGHAUS SCHOLARSHIP OF NORMAL COLLEGE.

GOUCHER COLLEGE.

HARVARD UNIVERSITY.

KANSAS STATE AGRICULTURAL COLLEGE.

LUCRETIA CROCKER SCHOLARSHIPS.

MOUNT HOLYOKE COLLEGE.

NORTHWESTERN UNIVERSITY.

OBERLIN COLLEGE.

PRINCETON UNIVERSITY.

RADCLIFFE COLLEGE.

ROCHESTER UNIVERSITY.

ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH.

SMITH COLLEGE.

SYRACUSE UNIVERSITY.

UNIVERSITY OF CHICAGO.

UNIVERSITY OF CINCINNATI.

UNIVERSITY OF ILLINOIS.

UNIVERSITY OF MICHIGAN.

UNIVERSITY OF MISSOURI.

UNIVERSITY OF PENNSYLVANIA.

VASSAR COLLEGE.

WELLESLEY COLLEGE.

WISTAR INSTITUTE OF ANATOMY AND BIOLOGY.

YALE UNIVERSITY.

5. EVENING LECTURES, 1913

-
- H. E. CRAMPTON....."Four Journeys among the Islands
of Polynesia".....July 3.
- A. G. MAYER....."Effects of the Electrolytes of Sea-
water upon the Rate of Nerve
Conduction in *Cassiopea*".....July 8.
- JOHN AUER....."Anaphylaxis".....July 11.
- T. H. MORGAN....."Heredity in *Drosophila*".....July 15.
- STEWART PATON....."The National Campaign for Men-
tal Hygiene in Relation to the
Study of Human Activities"....July 18.
- W. J. V. OSTERHOUT... "Some Quantitative Researches on
the Permeability of Plant Cells". July 22.
- E. S. MORSE....."Mars and its Mysteries".....July 25.
- W. E. GARREY....."Some Aspects of the Physiology of
Cardiac Nerves".....July 29.
- C. H. EIGENMANN.... "The Panama Problem and a Trip
Through Colombia, South Am-
erica".....August 1.
- C. E. MCCLUNG....."Chromosome Individuality".....August 5.
- C. R. STOCKARD....."Injurious Treatments of the Male,
and the Influence on the Off-
spring".....August 8.
- CHARLES T. BRUES and
M. J. ROSENAU....."The Relation of the Stable Fly
(*Stomoxys calcitrans*) to the Trans-
mission of Infantile Paralysis"....August 12.

6. MEMBERS OF THE CORPORATION

 I. LIFE MEMBERS, 1912.

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- ANDREWS, MRS. GWENDOLEN FOULKE, Baltimore, Md.
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ALLYN, DR. HARRIET M.,
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BIGELOW, PROF. R. P., Mass. Inst. Technology, Boston, Mass.
BINFORD, DR. RAYMOND, Guilford College, S. C.
BOX, MISS CORA MAY, Univ. of Cincinnati, Cincinnati, O.
BRADLEY, DR. HAROLD S., Univ. of Wisconsin, Madison, Wis.
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BUDINGTON, PROF. R. A., Oberlin College, Oberlin, Ohio.
BUMPUS, DR. H. C., University of Wisconsin, Madison, Wis.
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- CALKINS, PROF. GARY N., Columbia Univ., New York City.
CALVERT, PROF. PHILIP P., Univ. of Pennsylvania, Philadelphia.
CARLSON, PROF. A. J., Univ. of Chicago, Chicago, Ill.
CARVER, MR. GAIL L., Mercer Univ., Macon, Ga.
CARY, DR. L. R., Princeton Univ., Princeton, N. J.
CATTELL, PROF. J. McKEEN, Garrison-on-Hudson, New York.
CHAMBERS, DR. ROBERT, Univ. of Cincinnati, Cincinnati, Ohio.
CHEESEMAN, DR. T. M., Garrison, N. Y.
CHESTER, PROF. WEBSTER, Colby College, Waterville, Me.
CHIDESTER, DR. F. E., Rutgers College, New Brunswick, N. J.
CHILD, PROF. C. M., Univ. of Chicago, Chicago, Ill.
CLAPP, PROF. CORNELIA M., Mt. Holyoke College, South Hadley, Mass.
CLARK, DR. E. R., Johns Hopkins Univ., Baltimore, Md.
COE, PROF. W. R., Yale University, New Haven, Conn.
COLTON, PROF. H. S., Ardmore, Pa.
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COMSTOCK, PROF. J. H., Cornell University, Ithaca, N. Y.

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DORRANCE, MISS FRANCES, Dorranceton, Pa.

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